

**Department of Conservation and Land  
Management**

**Vegetation Health Service**

**Annual Report 2004-2005**

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# Vegetation Health Service – Annual Report 2004 – 2005

## *Phytophthora* Detection

### **1. Introduction**

The Vegetation Health Service (VHS) provides a dedicated, specialist scientific service for the detection and identification of *Phytophthora* species from samples associated with the management of the State's forest and conservation estate, logging and mining activities, private industry and research. The VHS is funded by CALM's Sustainable Forest Management Division (90%) and Nature Conservation Division (10%). It is run by Science Division staff based at CALM's Kensington Research Centre. Its services are offered free of charge to all CALM and FPC sections and personnel. The service is also available to external clients at a standard fee of \$77 (incl. GST) per sample, with special discounted rates applying to Alcoa World Alumina Australia and to Natural Heritage Trust projects.

Samples received by the VHS in most cases include a mixture of soil and plant-root material, which is baited for *Phytophthora* using the standard *Eucalyptus sieberi* cotyledon baiting method. Bait material is plated to selective agar medium for incubation, and any possible *Phytophthora* colonies that emerge are then isolated to pure culture for identification to species. Where isolation of the pathogen from specific host-plant tissue is required, roots are surface-sterilised and direct-plated to selective agar medium for *Phytophthora* isolation.

Results are supplied to clients as soon as possible. All results (both *Phytophthora*-positive and negative) are added to the VHS database, along with details of sampling location, land tenure, etc. This database now contains 26,043 records (at 30<sup>th</sup> June 2005), and this information resource is made available as required. Representative *Phytophthora* cultures are added to the VHS Culture Collection (see Section 3 below), which now contains 932 cultures. These cultures are made available to researchers, both in CALM and in other institutions, on request.

The VHS also provides advice to assist Departmental staff and also the public with other plant disease problems in forests, plantations, parks and reserves, and nurseries.

### **2. Annual summary – samples processed**

During the 2004-2005 financial year the VHS received 1,250 samples for testing for the presence of *Phytophthora* (Table 1 and Figure 1).

The sources of these samples are as follows:

**CALM** – samples sent by CALM Dieback Interpreters (or by contractors to CALM), and District staff, in fulfilment of CALM's forest and land management responsibilities.

**ALCOA** – samples sent directly by Alcoa (or by contractors to Alcoa) in fulfilment of Alcoa's forest management responsibilities prior to and after mining activities, on the CALM estate.

**PRIVATE** – samples sent directly by external clients (land managers or private contractors).

**RECOUP** – samples for external clients sent by CALM dieback interpreters.

**FPC** – samples sent directly by the Forest Products Commission, including Nurseries.

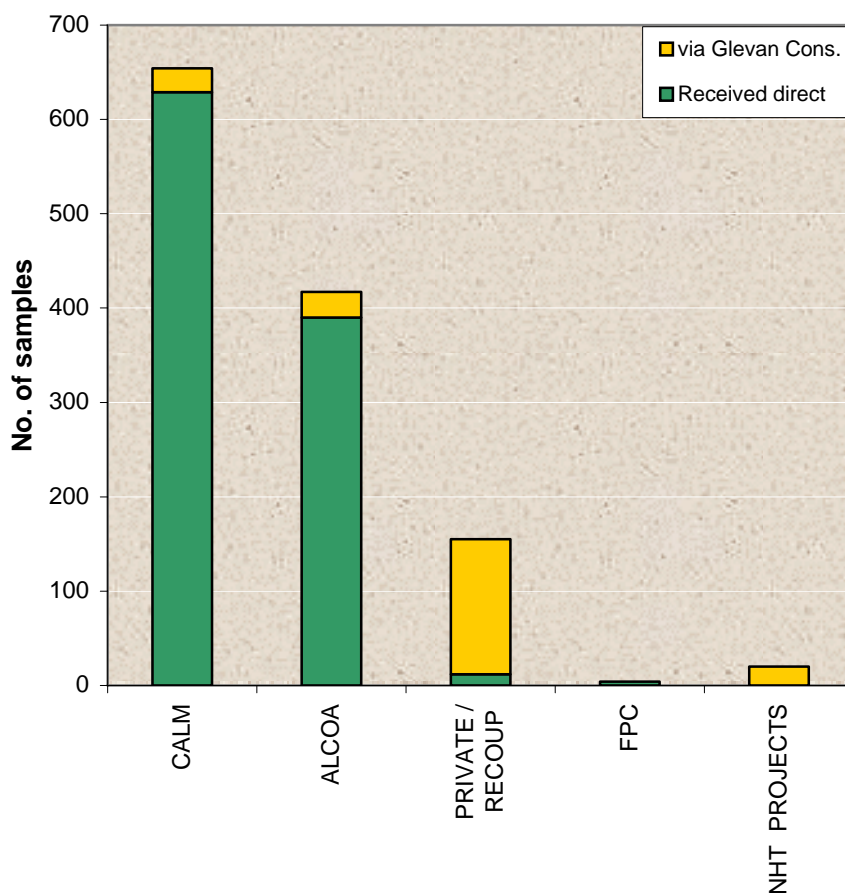
**NHT** – samples associated with projects funded by the Natural Heritage Trust.

The majority of samples processed by the VHS belong to CALM and Alcoa. A contract to process 304 samples for Alcoa's monitoring program for dieback-free rehabilitated mine-pits was secured in 2004-05 [this work was also done in 2002-03 and 2003-04]. The CALM component includes samples sent by CALM Dieback Interpreters from CALM-managed forest being monitored for *Phytophthora* in conjunction with logging by the FPC. The reduction of logging in native forest by the FPC has significantly reduced the amount of

CALM samples processed in recent years, but there was an increase in 2004-05. Consultants (Glevan Consulting) supplied 215 samples from various sources including CALM land and Alcoa (Table 1 and Figure 1). Table 2 and Figure 2 show details of the sources (by District) of CALM samples received for the year (including Recoup samples, but excluding the CALM samples collected by Glevan). The locations where CALM samples were collected are shown on the attached **Map**, with results broken down to distinguish *P. cinnamomi*, Other *P. spp.*, and Negative.

**Table 1** and **Figure 1**. Numbers of samples received from major sources, including consultants (Glevan Consulting), in 2004-2005. Total numbers of samples received from the same sources in 2003-2004 are given in the Table for comparison.

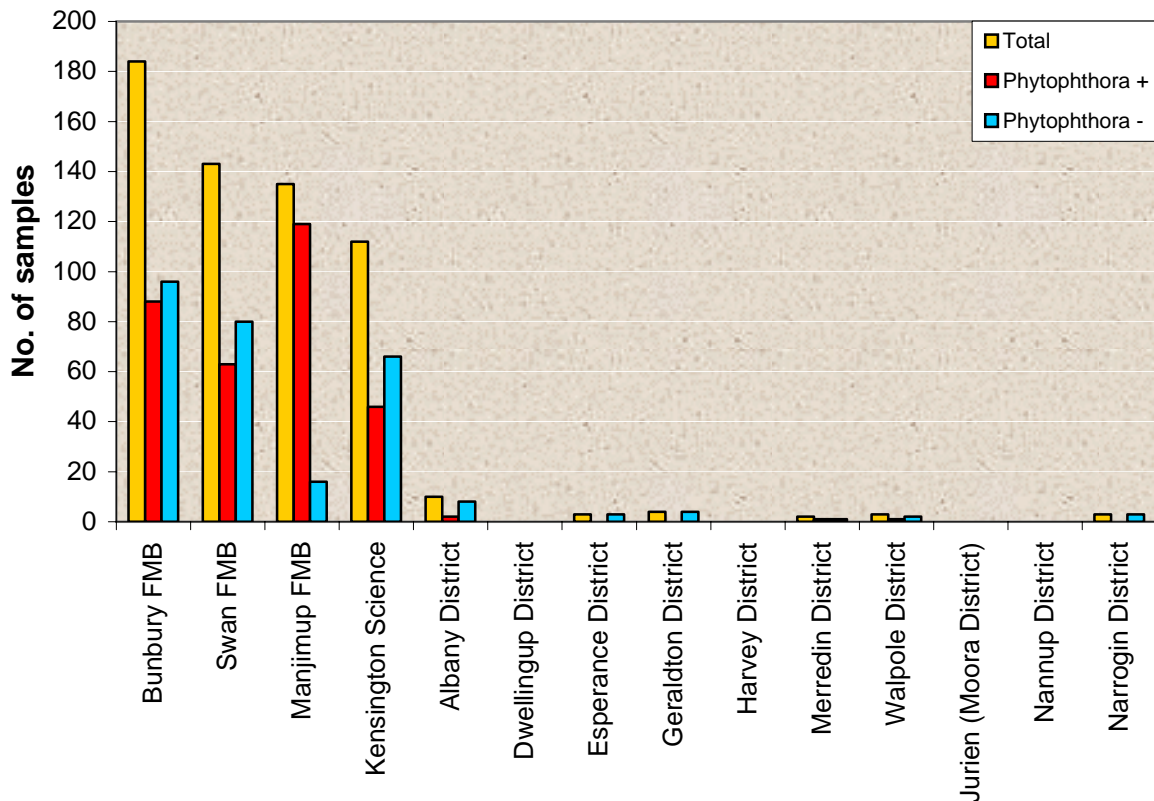
Source	No. of samples			
	Received direct	Received via Glevan Cons.	Total 2004-2005	Total 2003-2004
CALM	629	25	654	565
ALCOA	390	27	417	736
PRIVATE / RECOUP	12	143	155	108
FPC	4	0	4	14
NHT PROJECTS	0	20	20	12
<b>TOTAL</b>	<b>1035</b>	<b>215</b>	<b>1250</b>	<b>1435</b>



**Table 2** and **Figure 2**. Numbers of samples received from CALM offices in 2004-2005, and numbers giving positive or negative recoveries of *Phytophthora*. Total numbers of samples received from the same sources in 2003-2004 are given in the Table for comparison.

CALM Office	No. of Samples <sup>1</sup>			
	Total received 2004-2005	Ph. Positive 2004-2005	Ph. Negative 2004-2005	Total received 2003-2004
Bunbury FMB	184	88	96	167
Swan FMB	143	63	80	97
Manjimup FMB	135	119	16	133
Kensington Science	112	46	66	43
Albany District	10	2	8	30
Dwellingup District	0	0	0	4
Esperance District	3	0	3	52
Geraldton District	4	0	4	14
Harvey District	0	0	0	12
Merredin District	2	1	1	0
Walpole District	3	1	2	0
Jurien (Moora District)	0	0	0	4
Nannup District	0	0	0	16
Narrogin District	3	0	3	2
<b>TOTAL</b>	<b>599</b>	<b>320</b>	<b>279</b>	<b>574</b>

<sup>1</sup>Received direct from CALM office - includes recoups and private, but not Glevan/CALM samples.



### 3. *Phytophthora* species

During 2004-2005, *Phytophthora* was isolated from a total of 574 samples (Table 3, Figure 3). *P. cinnamomi* was the species most frequently isolated (403 samples). *P. citricola* was isolated from 63 samples, and two samples yielded both *P. cinnamomi* and *P. citricola*. Twelve *Phytophthora* isolates (“*P. species*”) were still to be fully identified to species.

Representative pure cultures of the various *Phytophthora* species isolated, and cultures representing different geographic locations, ecosystems or host plants, or morphological types, are added to the permanent Culture Collection. These cultures are maintained in a pure and viable condition by periodically sub-culturing, checking their purity and establishing fresh storage cultures. The VHS now has 932 cultures in the Collection.

#### 3.1. A new *Phytophthora* sp. found

One hundred *Phytophthora* isolates are listed separately as “***P.sp.2***” (see Table 3, Figure 3). A smaller number of isolates of this type were also found in 2003-04.

The morphological characters [as used in traditional *Phytophthora* species identification] of the *P.sp.2* isolates very closely resemble those of *P. citricola*. However, DNA tests carried out through the **Centre for *Phytophthora* Science and Management** (CPSM) at Murdoch University indicate that these isolates represent one or more separate, new taxa that are in fact not closely related to *P. citricola*. [It is worth noting here that new taxa of *Phytophthora* are now being found world-wide, with the use of DNA technology.]

These *P.sp.2* isolates all came from samples collected in Alcoa’s rehabilitated mine-sites [within State Forest], both in 2004-05 and 2003-04. However, a check of our early WA isolation records has shown that cultures of this type have been isolated from samples taken by CALM staff in jarrah forest, located well away from mine-sites, at various times back to the mid-1980s. They were then routinely identified as *P. citricola* (by the VHS and all other workers who examined them, including CABI, UK).

The presence of *P.sp.2* in a given area may hold some implications for dieback management (as it is distinct from *P. citricola*, which is generally regarded as causing little damage to vegetation). Preliminary evidence from the recent samples suggests that this *Phytophthora* sp. has a significant pathogenic capability. Furthermore, being homothallic, it can be expected to survive in soil over summer by means of resting oospores (unlike *P. cinnamomi*); this also suggests that it can be introduced to un-infested areas under dry soil conditions more easily than *P. cinnamomi*.

It is likely that a student project in 2006 will carry out further work to describe and identify these *P.sp.2* cultures and investigate their pathogenicity and possible origin. We hope soon to publish this new species in collaboration with the CPSM, along with another new *Phytophthora* sp. (morphologically similar to *P. cactorum* and now designated “***P.sp.1***”) that was isolated from *Banksia* woodland samples by the VHS in 2002-2003.

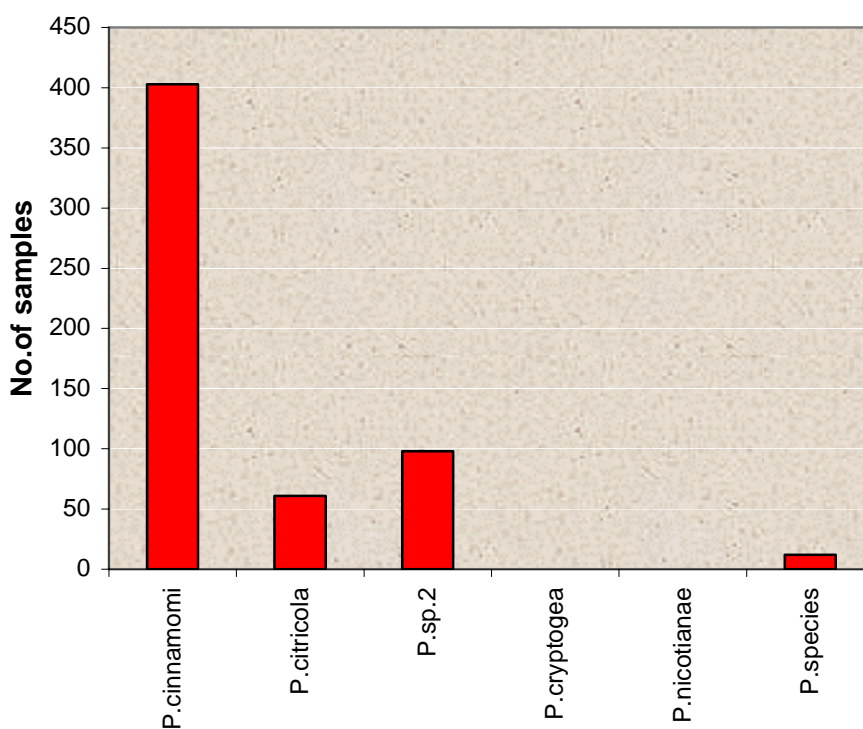
**Table 3** and **Figure 3**. Numbers of samples from which *Phytophthora* species were isolated by the VHS in 2004-2005.

<i>Phytophthora</i> species	No. of samples with positive <i>Phytophthora</i> recovery	
	Primary result	Second species <sup>1</sup>
<i>P. cinnamomi</i>	403	
<i>P. citricola</i>	61	2
<i>P. sp.2</i> <sup>2</sup>	98	2
<i>P. cryptogea</i>	0	
<i>P. nicotianae</i>	0	
<i>P. species</i> <sup>3</sup>	12	
<b>TOTAL</b>	<b>574</b>	<b>4</b>

<sup>1</sup>Second species – these samples yielded a second *Phytophthora* species, each of them in addition to *P. cinnamomi*.

<sup>2</sup>*P. sp. 2* denotes a new *Phytophthora* species resembling *P.citricola*.

<sup>3</sup>*P. species* denotes *Phytophthora* cultures that are in the process of being identified or are unable to be fully identified.



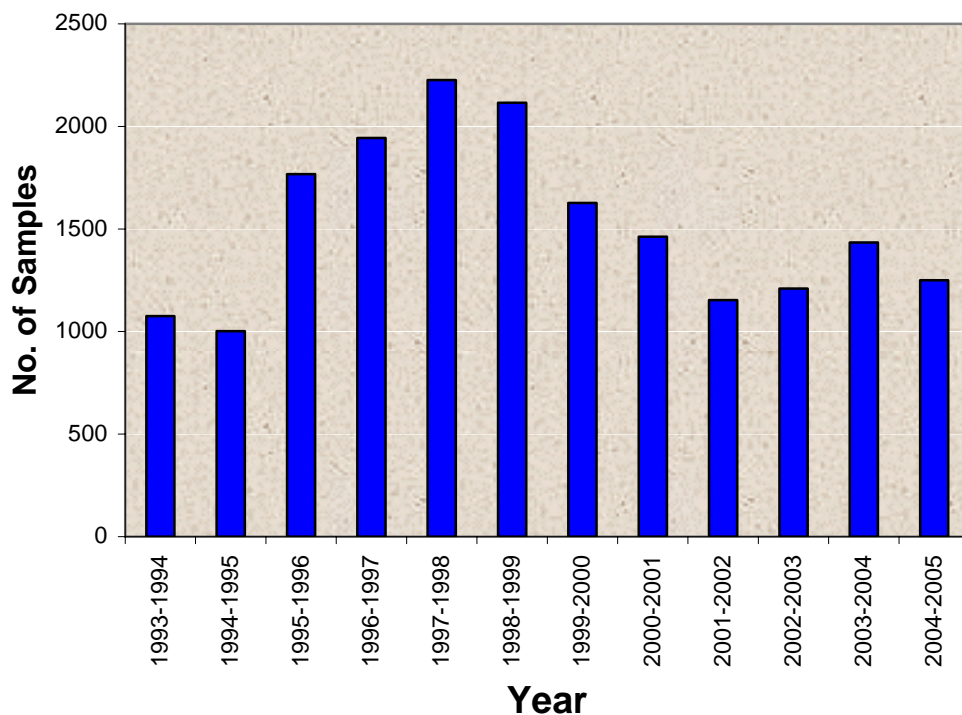
#### **4. Historical record of samples processed**

Since the VHS laboratory was established at Kensington in 1992 (initially as the Dieback Detection Service), a total of 19,361 samples have been processed for *Phytophthora* (to 30<sup>th</sup> June 2005) (Table 4 and Figure 4).

Prior to 1992, the routine sample processing was carried out at Dwellingup Research Centre. All *Phytophthora* species identification from samples processed between 1985 and 1992 was completed by M Stukely at Kensington. Records from these earlier years, for which map references are available, have been included in the VHS database which now has a total of 26,043 records.

**Table 4** and **Figure 4.** Numbers of samples processed by the VHS for *Phytophthora* detection from 1992-93 to 2004-05.

<b>Year</b>	<b>No. of Samples</b>
1992-1993	1095
1993-1994	1075
1994-1995	1001
1995-1996	1767
1996-1997	1944
1997-1998	2227
1998-1999	2115
1999-2000	1626
2000-2001	1463
2001-2002	1153
2002-2003	1210
2003-2004	1435
2004-2005	1250
<b>TOTAL</b>	<b>19361</b>



## **5. Concluding Comment**

Land managers are encouraged to make full use of the services provided by the VHS for the detection of *Phytophthora*. The sample-processing service is provided free of charge to all CALM and FPC personnel and sections.

**Best practice management methods** include the “detection, diagnosis, demarcation and mapping of infested areas and hence the identification of un-infested areas”. The laboratory testing of samples for the presence of *Phytophthora* is an integral part of this process.

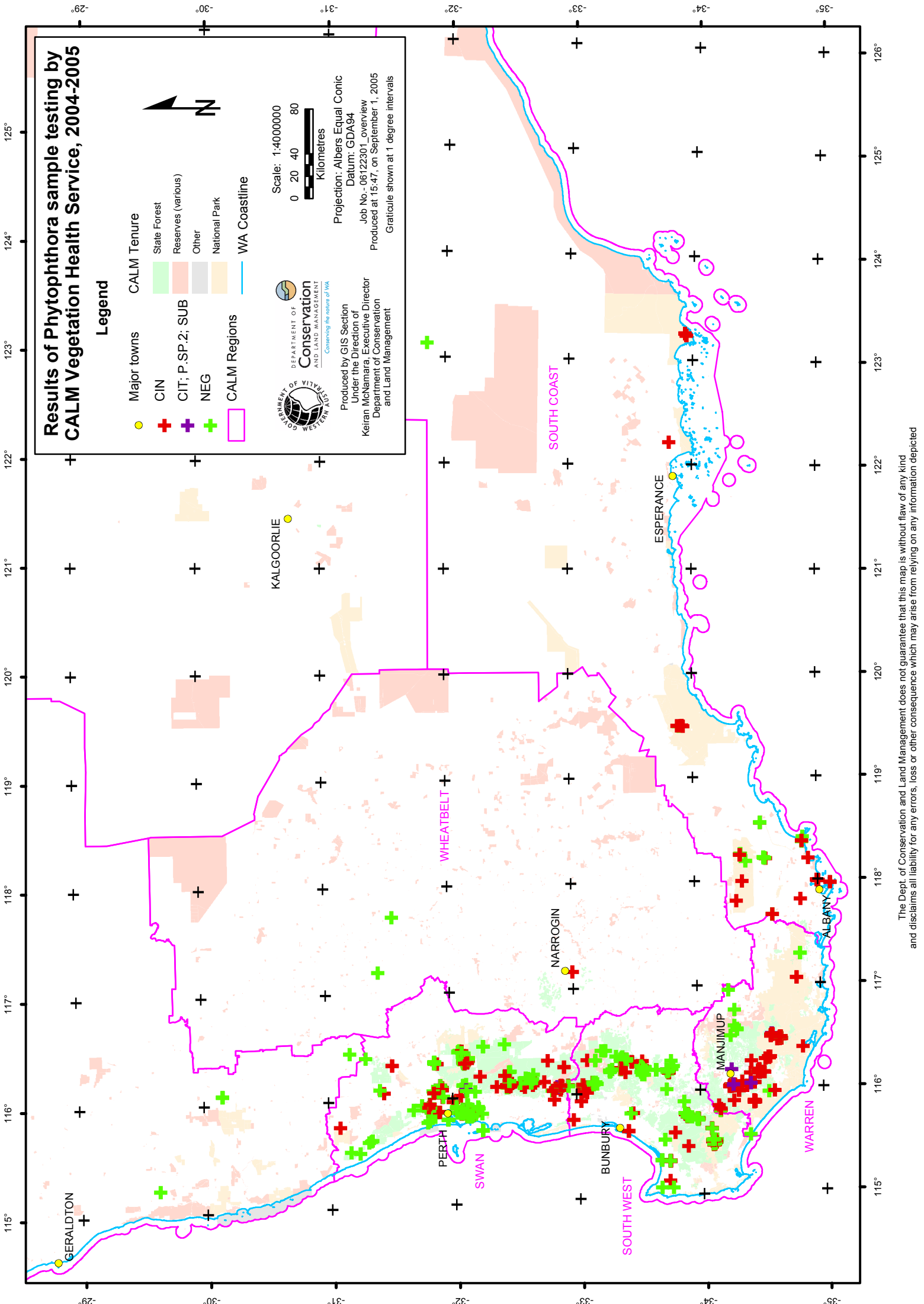
It is important to recognise that areas must be **regularly re-assessed and re-tested** for *Phytophthora* infestation, since with time the pathogen will continue to spread from its known, established foci. This spread may be autonomous (by root-to-root contact between host plants, and through dispersal of zoospores in water), or through the activity of vectors such as native and feral animals, and people with their vehicles and machinery.

The **appropriate frequency of re-assessment and re-testing** will depend upon several factors:

- the **values** associated with a given area,
- the **likelihood** or **level of risk** of introduction of *Phytophthora* into that area, and
- the **consequences** of its introduction to the ecosystem.

Information on the distribution of *Phytophthora* must be up-to-date for land management to be most effective.





# Results of Phytophthora sample testing by CALM Vegetation Health Service, 2004-2005

## Legend

- Major towns
- CIN
- CIT; P.SP.2; SUB
- NEG
- CALM Regions
- CALM Tenure
- State Forest
- Reserves (various)
- Other
- National Park
- WA Coastline



Scale: 1:4000000  
 0 20 40 80  
 Kilometres

Projection: Albers Equal Conic  
 Datum: GDA94  
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 Graticule shown at 1 degree intervals

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